

GLOBAL CLIMATE CHANGE:

What's Happening, and What Can We Expect

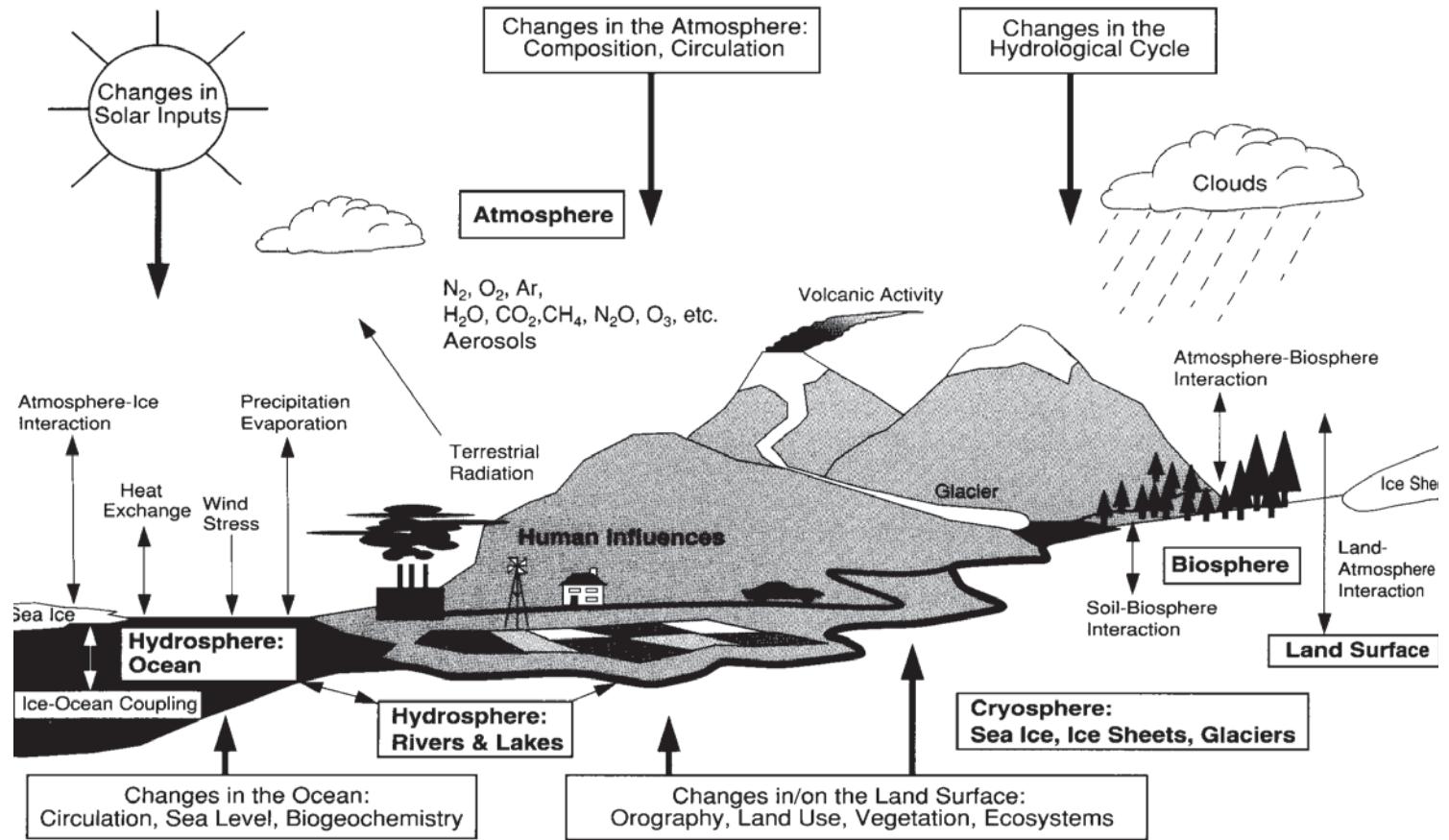
Irene Hanuta

Climate Change Branch, Manitoba Energy, Science and Technology

What is 'climate'?

- Climate is 'average weather'
 - and its variability
 - for a particular region
 - over a period of time
- Includes many different elements
 - temperature
 - rain/snow
 - sunshine hours
 - wind, etc.

However, the climate system is also influenced by many other complex interactions and feedbacks



The earth is getting warmer

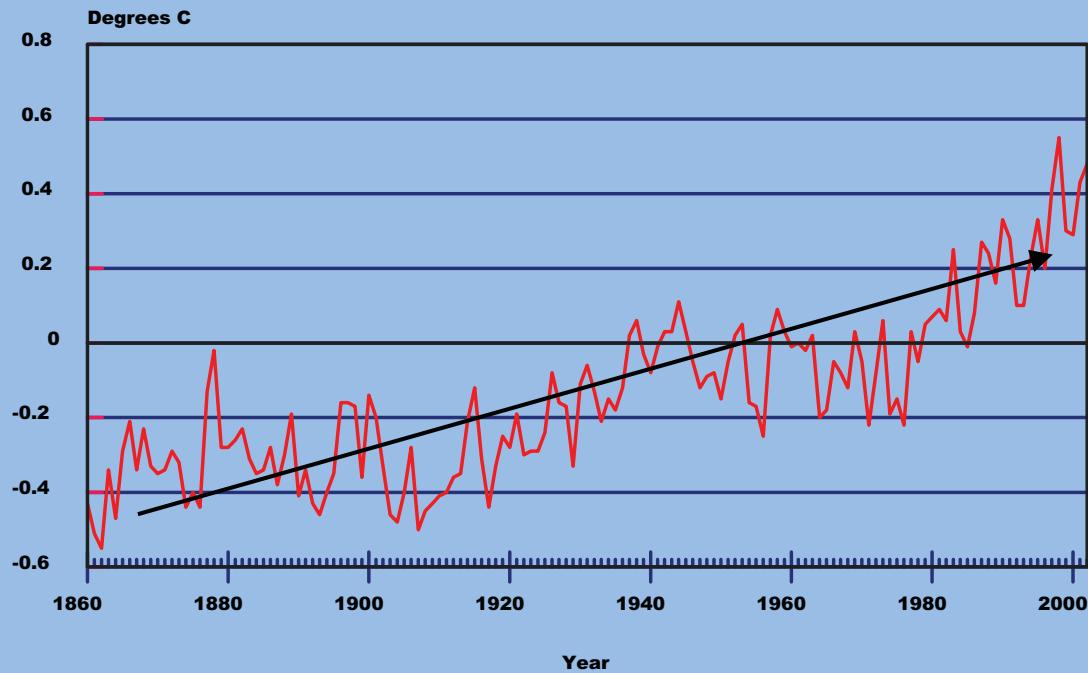
THE TOP 10

- 1: 1998
- 2: 2002
- 3: 2001
- 4: 1997
- 5: 1995
- 6: 1990
- 7: 1999
- 8: 2000
- 9: 1991
- 10: 1987

- 20th century the warmest globally in past 1000 years
- 1980s and 1990s warmest decades on record

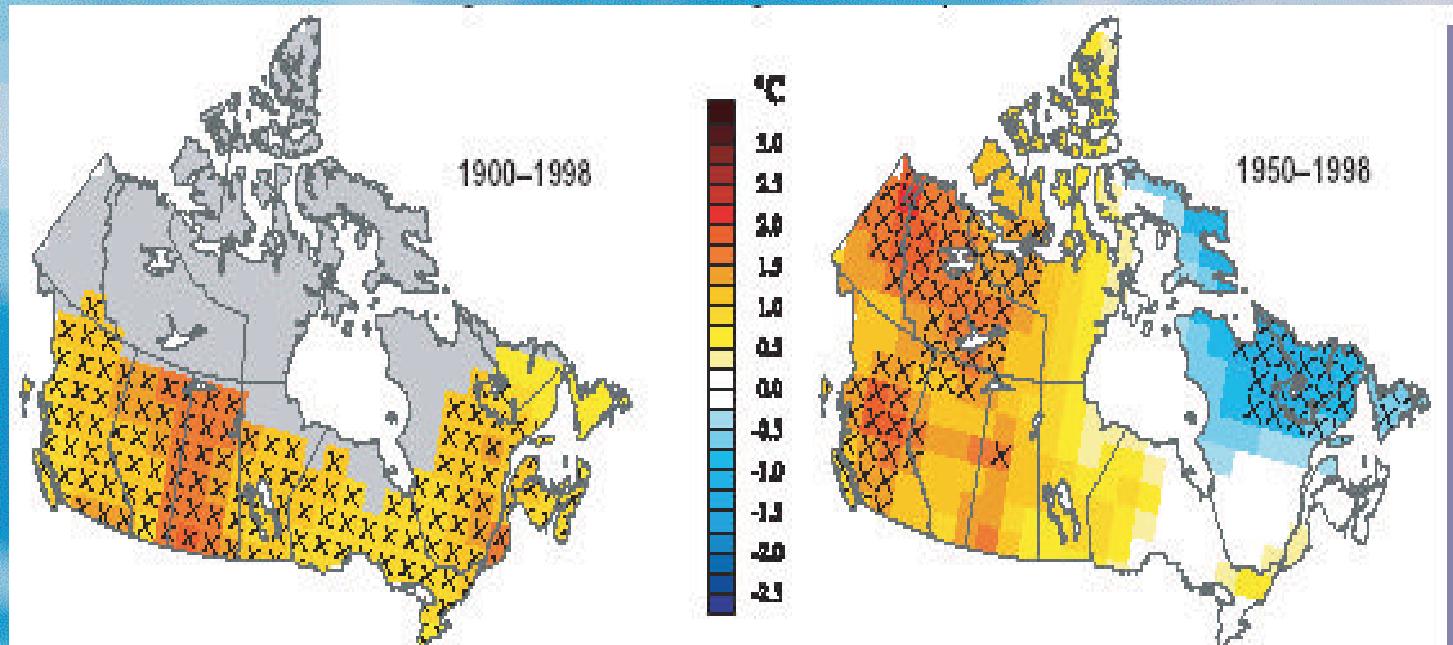
Global surface temperatures are rising

1860-2002



Relative to 1961-90 average temperature

Canadian temperatures have also increased substantially during the past century



From Zhang et al., 2000

The warming will continue

- Scientists predict average temperature increase between 1.4 - 5.8°C in next 100 years
- Small changes in average temperatures make a big difference:
 - ✓ Average temperatures today are only about 5°C warmer than they were during the last Ice Age

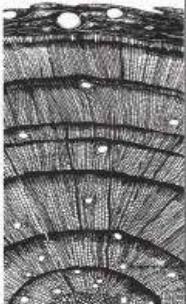
Temperature changes will vary

- Temperature changes in Canada won't be uniform
- Polar regions will warm more than mid-latitude regions
- The Atlantic will cool slightly

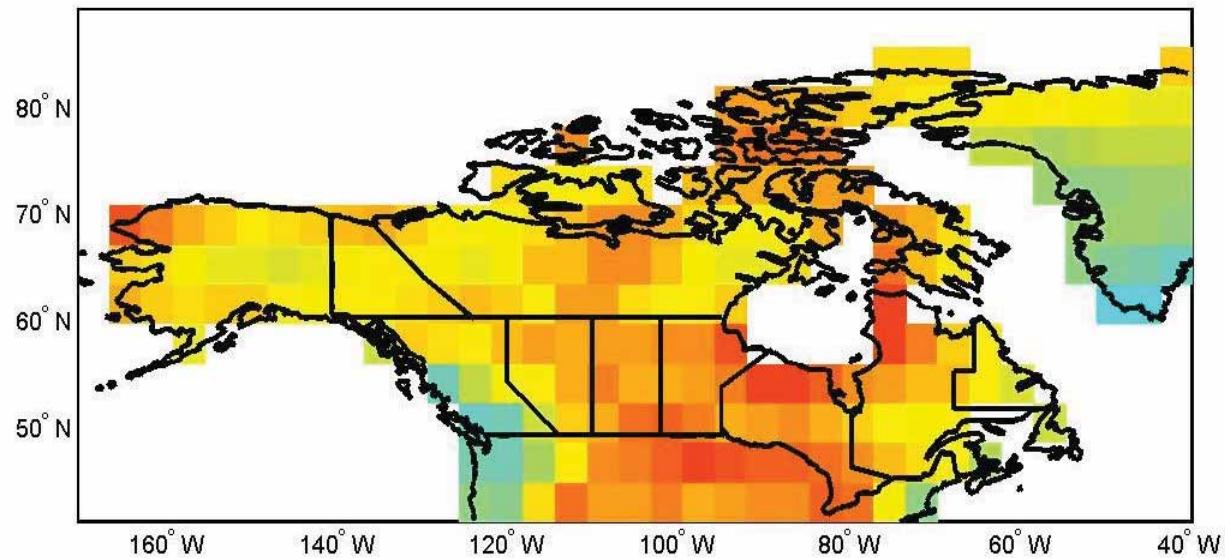
How do we know this is happening?



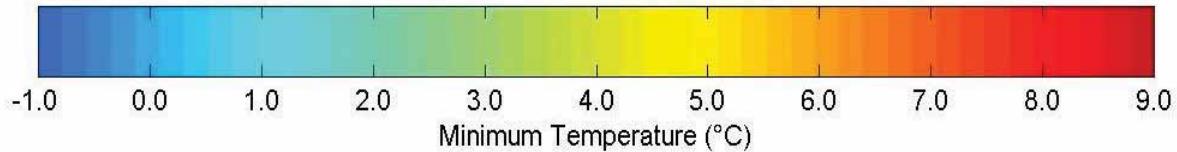
- Instrumental records - to 1860
- Ice cores, sediment cores, tree rings, historical records, traditional knowledge - evidence dating back several thousand years
- Satellite mapping & computer modelling for future predictions: Canadian model one of the best



Climate Change Modeling: Possible Future



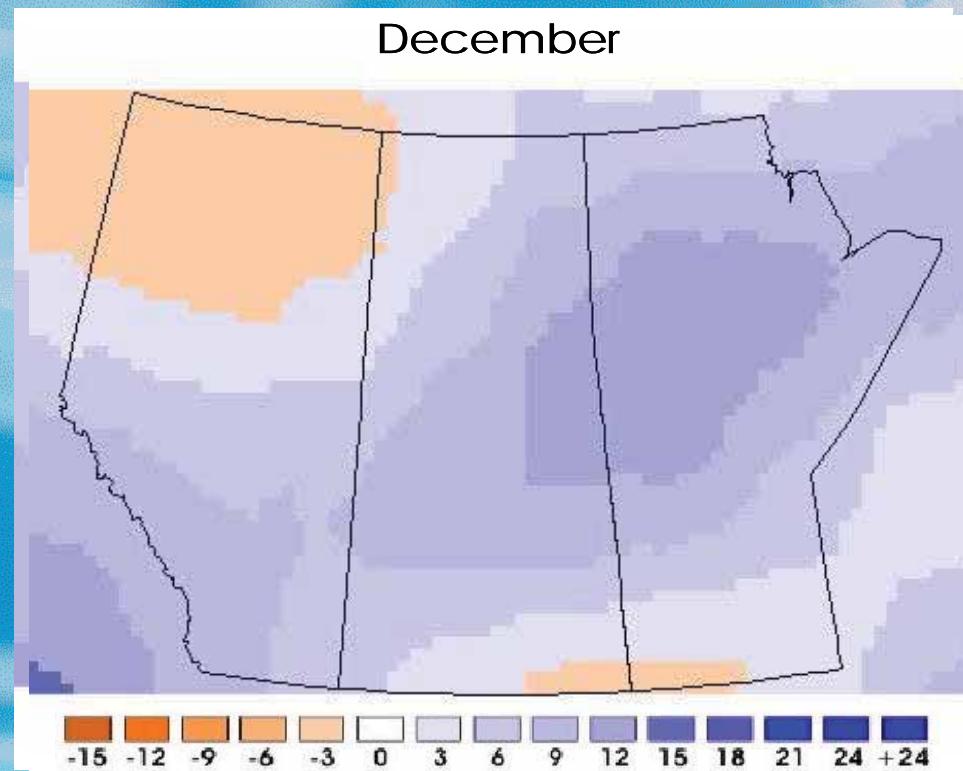
CGCM1, Mean Winter Temperature Change 2050



2050 Monthly Precipitation Scenarios

% Change

December

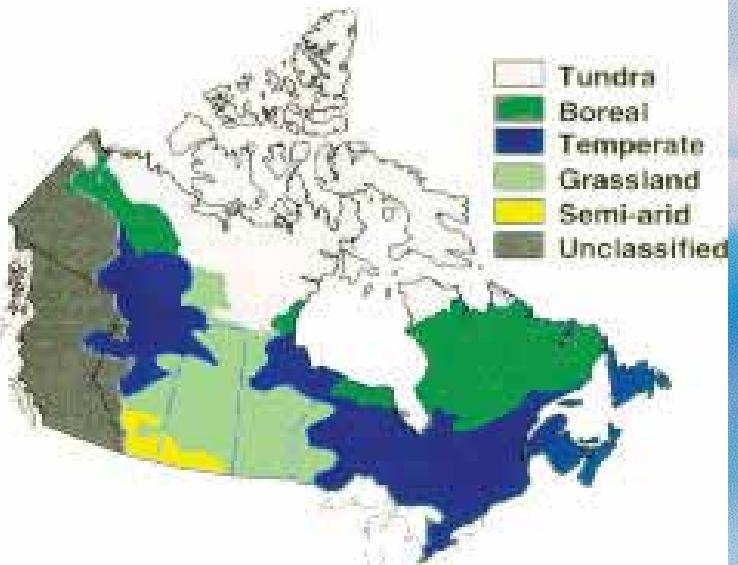


Possible Changes in Canada's Ecozones with 2x CO₂ Levels

Present Day



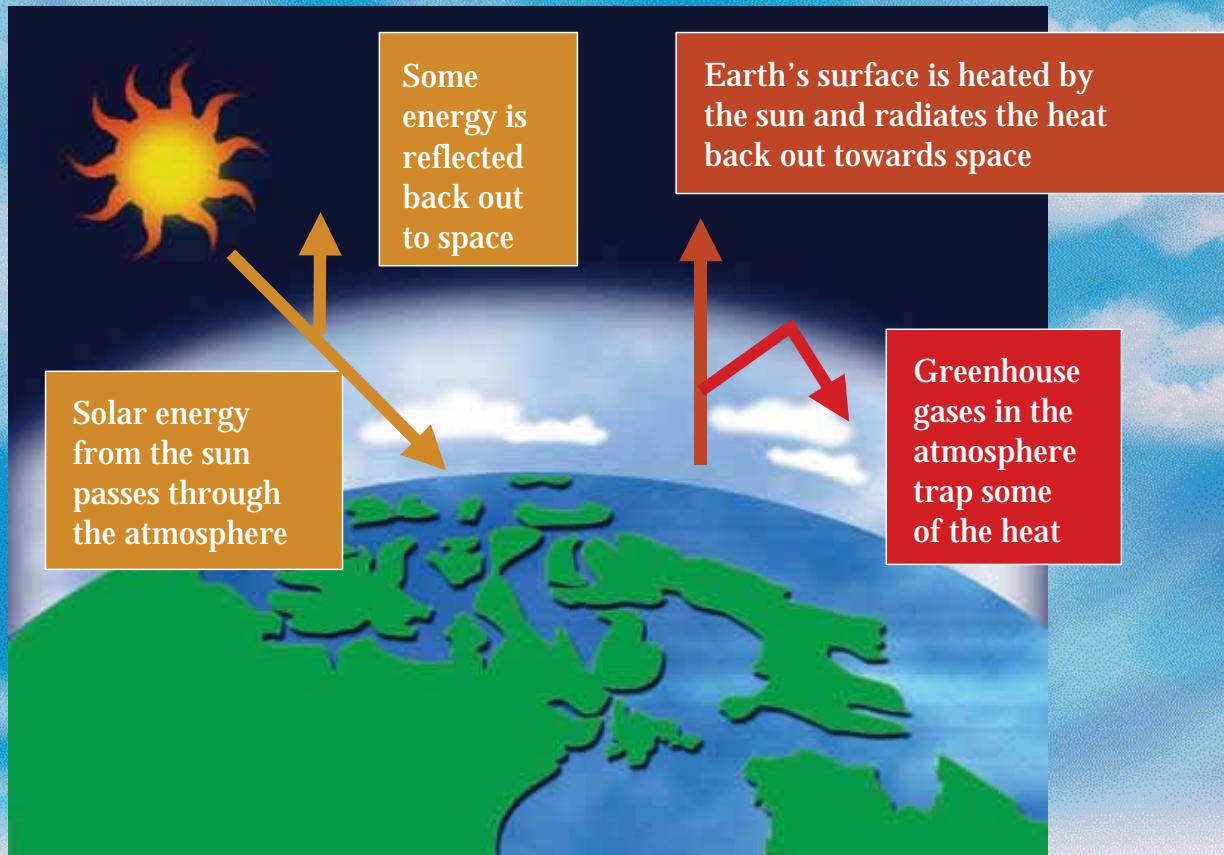
Year 2060



A blue-toned photograph of a cloudy sky. Bright sunbeams radiate from behind a large, white, fluffy cloud on the right side of the frame, creating a dramatic play of light and shadow against the blue sky.

Why is this
happening?

The greenhouse effect



What are the greenhouse gases?

Water vapour:

The most common gas



Methane:

From wetlands, rice paddies,
animal digestive processes,
landfills and sewage treatments



Ozone:

Exists naturally in the
upper atmosphere



Carbon dioxide:

Released through burning
Fossil fuels



Nitrous oxide:

From soils and the ocean
Agriculture fertilizers



Halocarbons:

Human-made chemicals



“ There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities. ”

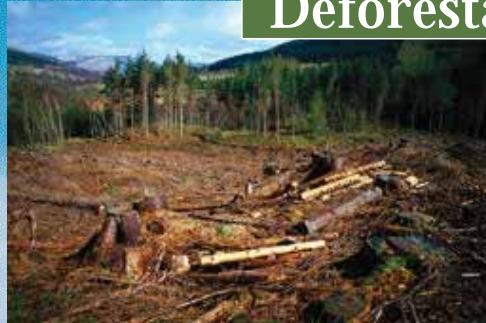
Intergovernmental Panel on Climate Change
2001

Human activities are intensifying the greenhouse effect

Electricity



Deforestation



Transportation



Industry



Global trends in fossil fuel CO₂ emissions



Source: ¹1999: Marland, G. et. al., Oak Ridge National Laboratory,
U.S. Department of Energy,
Oak Ridge, Tenn., USA.
http://cdiac.esd.ornl.gov/trends/emis/tre_glob.htm

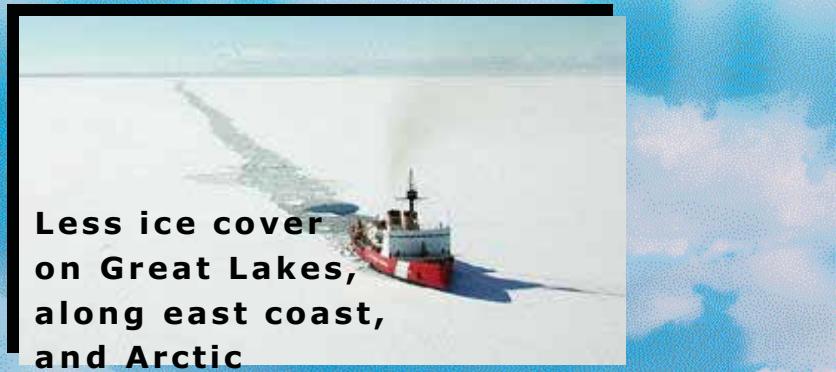
A blue-toned photograph of a beach scene. In the foreground, there are white, foamy ocean waves. The middle ground shows a sandy beach. The background features a bright, cloudy sky with various shades of blue and white clouds.

What's wrong
with
warmer
temperatures?

Potential benefits to Canadians include:



**Lower snow
removal costs**



**Less ice cover
on Great Lakes,
along east coast,
and Arctic**



**Longer, warmer
growing seasons**



**Lower
heating costs**

Potential impacts of climate change on Canada

The North



The Prairies



British Columbia

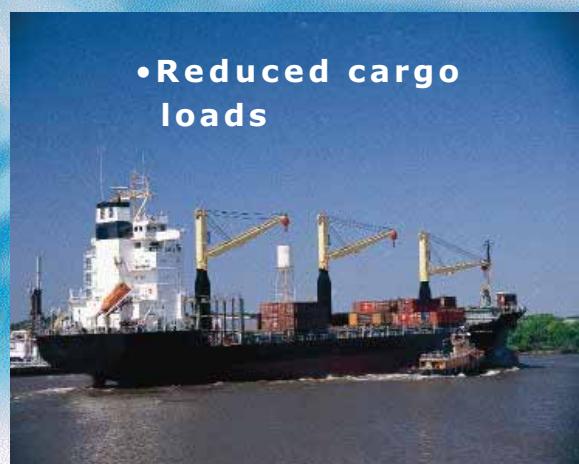
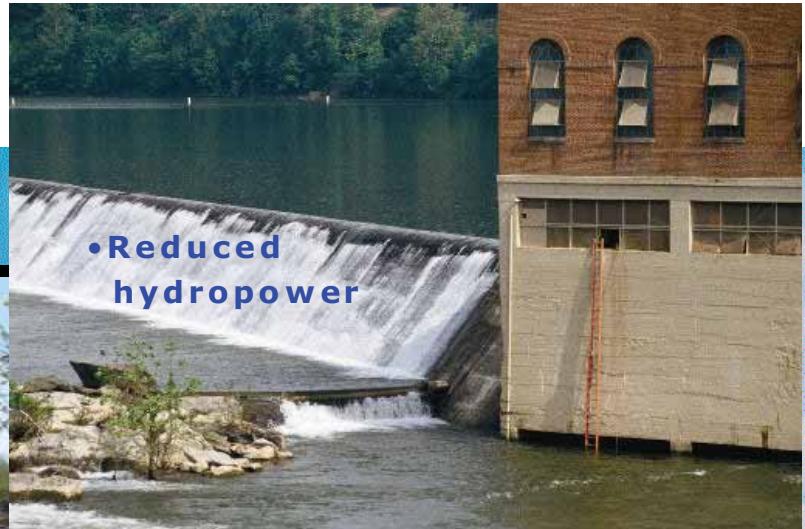


Ontario and Quebec



Atlantic Canada

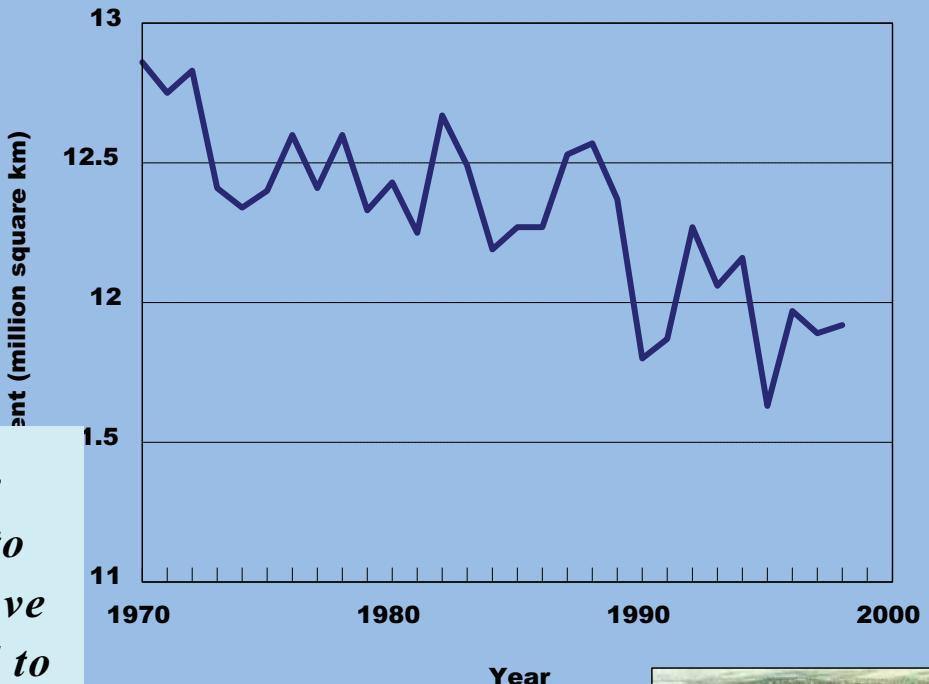
Lower lake/stream levels have important impacts:



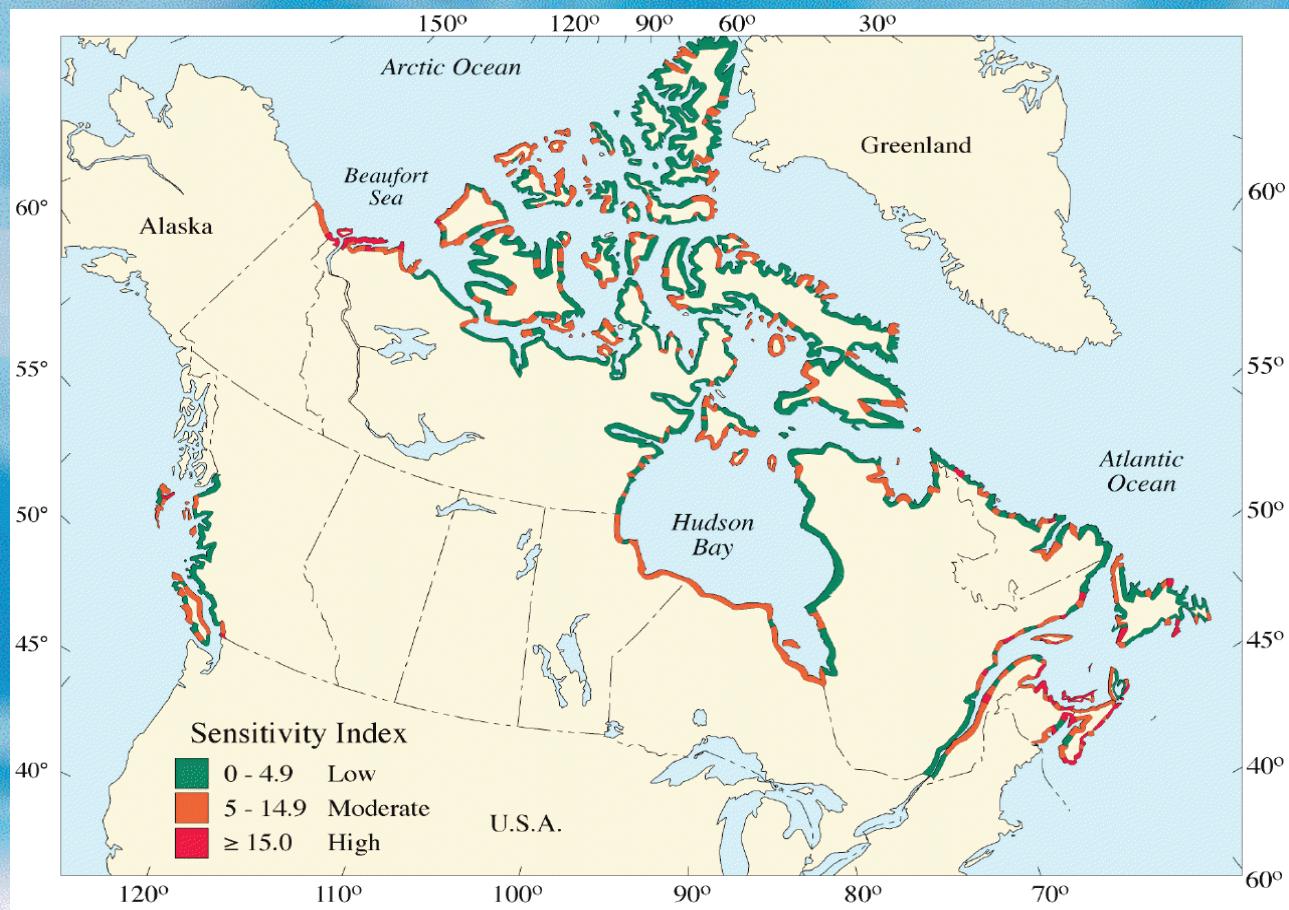
Arctic Ocean sea ice is less extensive



“ We used to go on the sea ice with dog sleds to hunt seals –now we have to use boats....We used to go a long way out – now we hunt close to shore. ”



Many regions of Canada's coastline are sensitive to sea level rise



The frequency and severity of droughts are also likely to increase in southern Canada

- SOUTHWEST MANITOBA, 2003
- CENTRAL AND NORTHERN MANITOBA, 2003
- SOUTHERN ALBERTA AND SASKATCHEWAN
- SOUTHERN B.C.





...but very wet seasons
may also become
more frequent or
more frequent
intense rainfalls - local floods



**Southeast
Manitoba**

**June 12-
16, 2002**

- 240 mm in 1 hour near border
- 133 mm in Steinbach



Vanguard, SK July 3, 2000

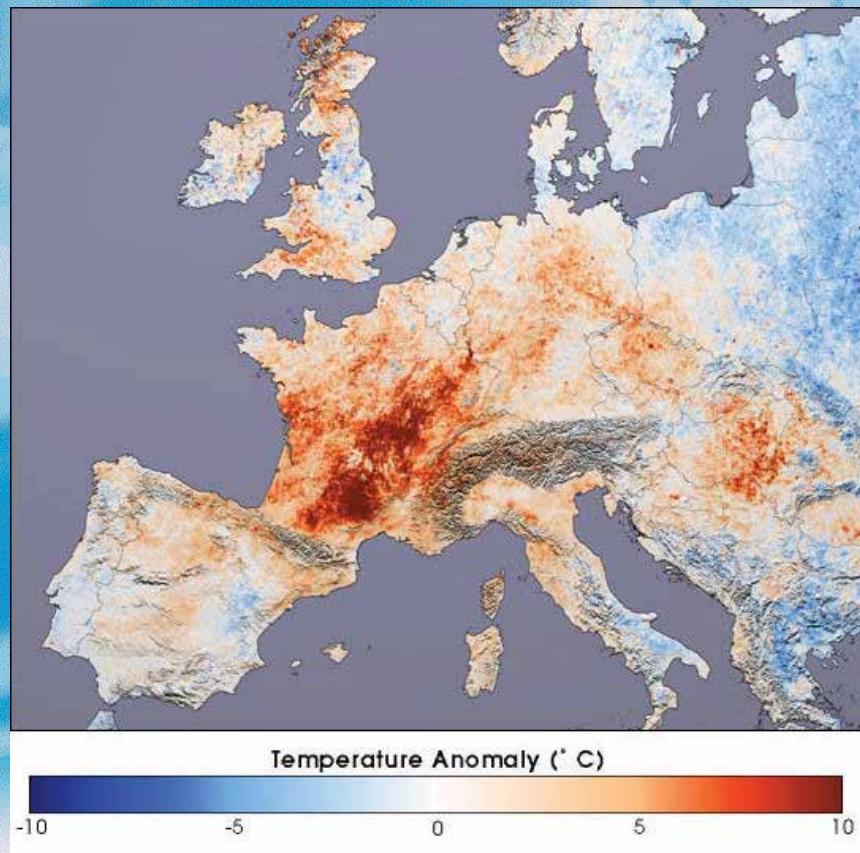
- eight-hour: 334-387 mm

Longer, more intense heat waves

HEAT STRESS

Europe 2003

- 100°F for weeks
- 35,000 deaths



There are also risks of the spread of diseases

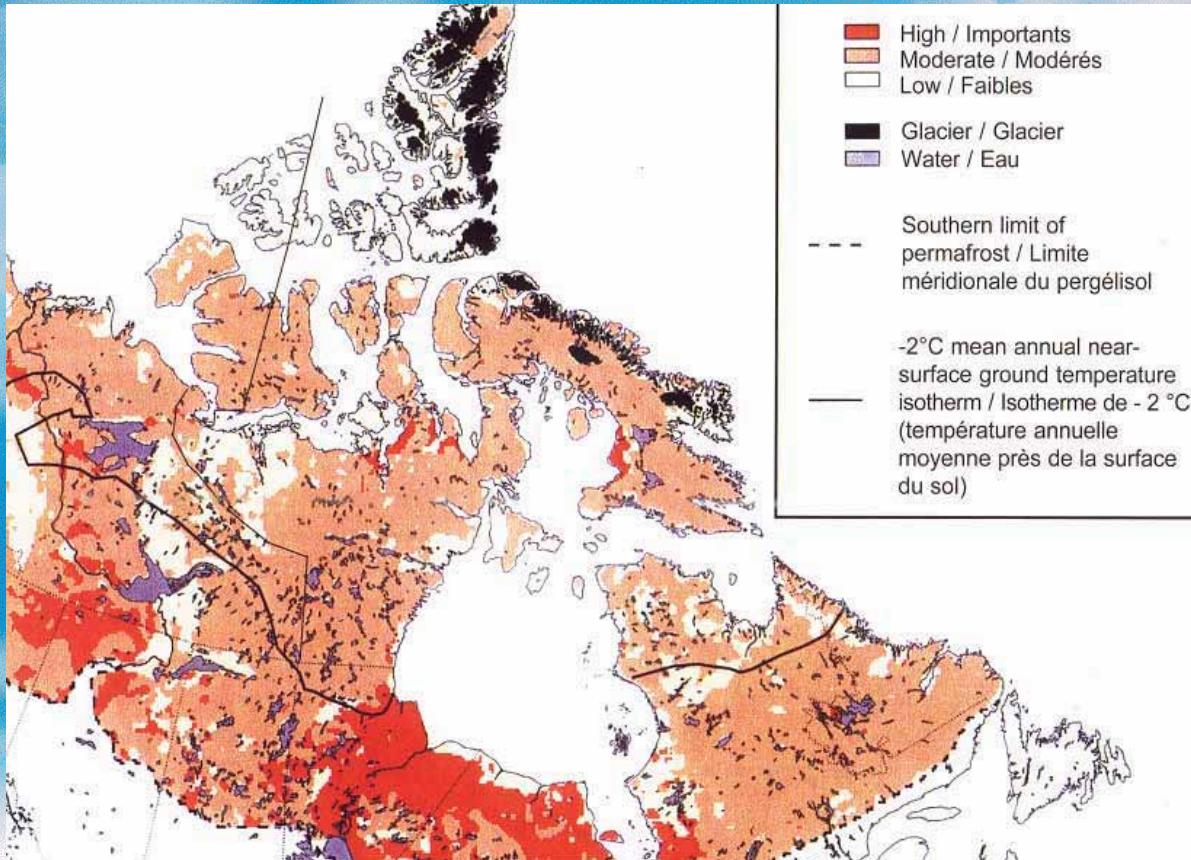


West Nile Virus



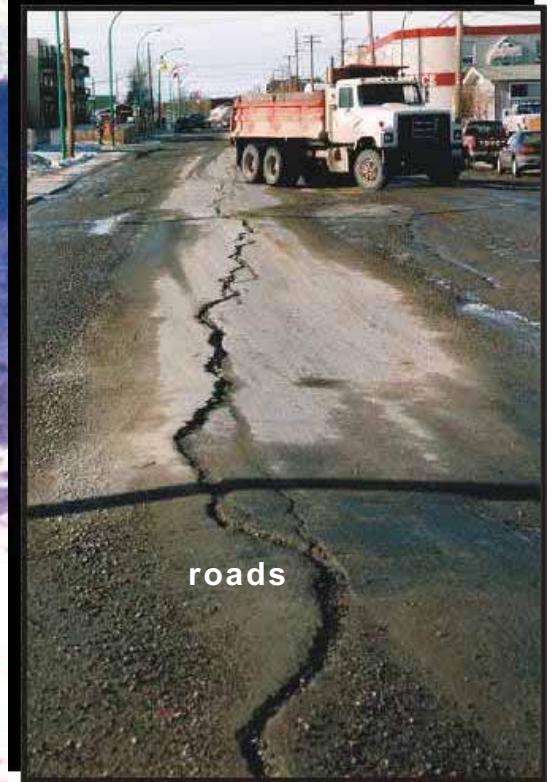
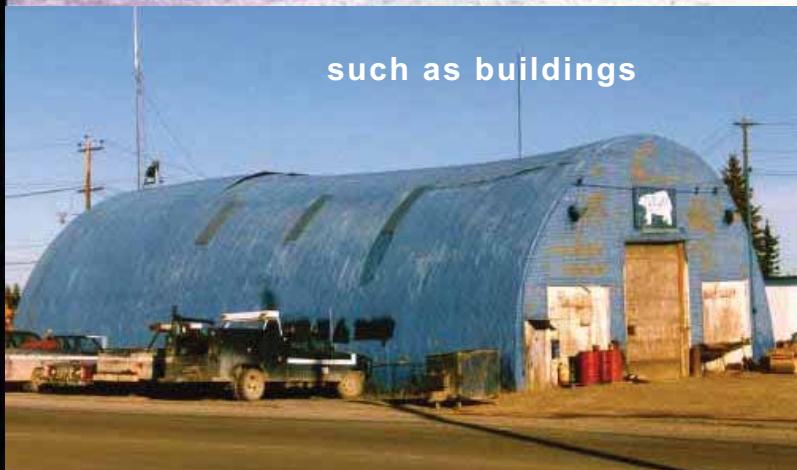
Lyme Disease

The North: Much of Canada's permafrost is highly sensitive to changes in climate



Increase in land instability may have large impacts on human structures

such as buildings



roads

and pipelines



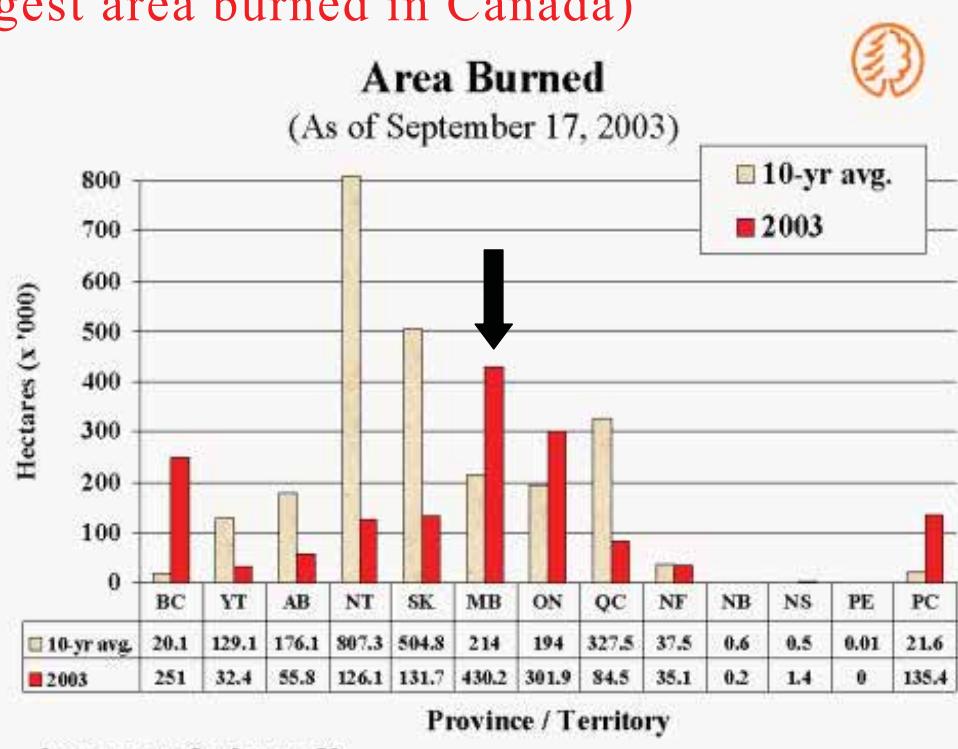
Manitoba Impacts

- Millions \$ in costs already due to unreliability of **winter ice roads** for northern community access
- Millions \$ more in costs now to develop land based winter road system with river crossings



Manitoba Impacts

- Increased risk of **forest fires** (1148 fires in 2003 and largest area burned in Canada)



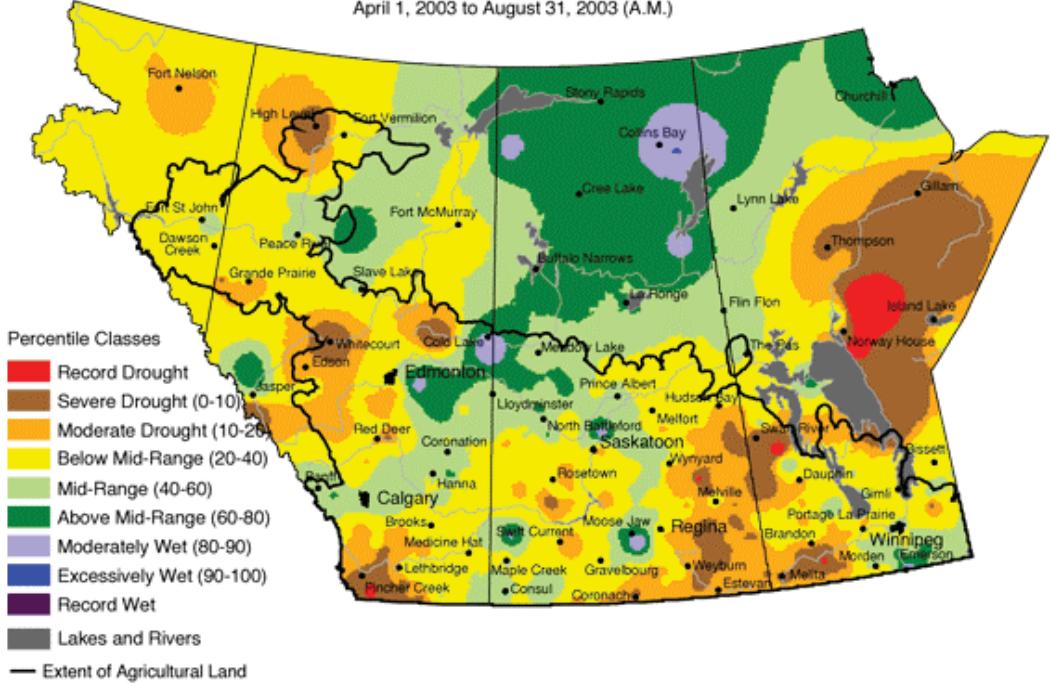


- Increased risk of drought
- Risk of decreased soil moisture

Manitoba Impacts

Current Precipitation Compared to Historical Distribution

April 1, 2003 to August 31, 2003 (A.M.)



Prepared by PFRA (Prairie Farm Rehabilitation Administration) using data from the Timely Climate Monitoring Network and the many federal and provincial agencies and volunteers that support it.

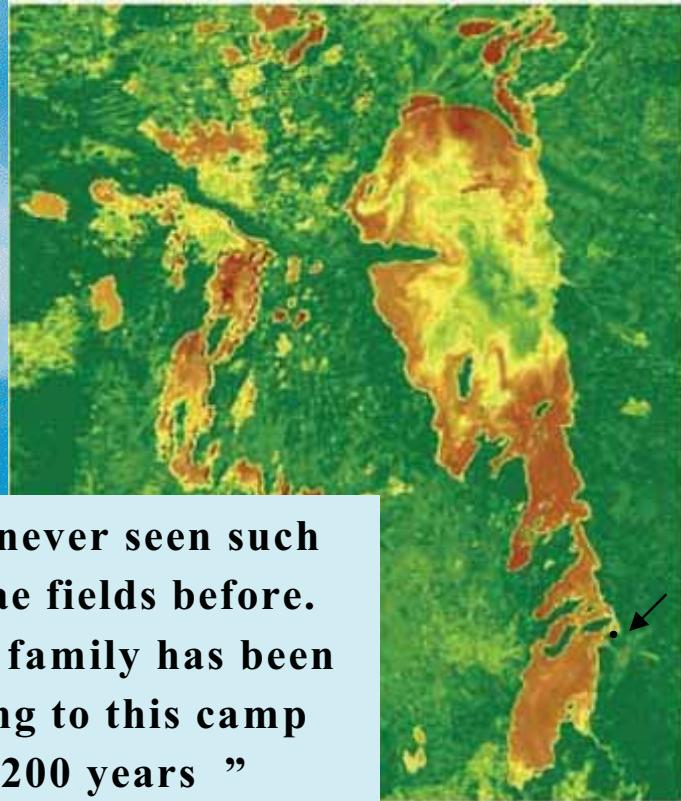
Manitoba Impacts

Lake Winnipeg

- Water levels
- Water temperature
- Algae blooms
- Fish species change

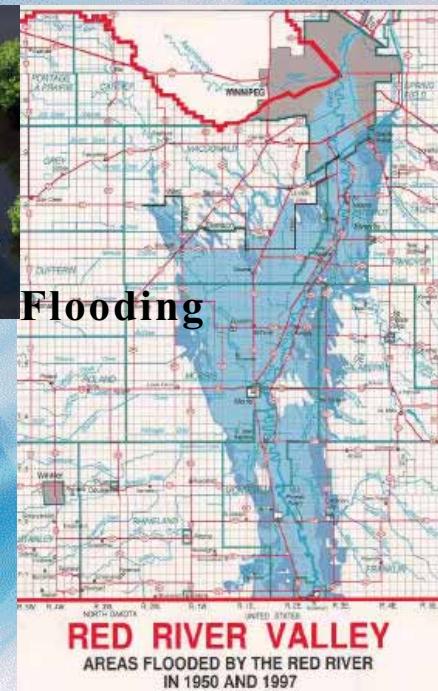
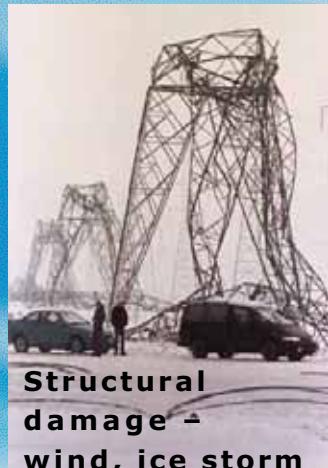
“ ...saw reefs I
never saw before ”

“ I never seen such
algae fields before.
My family has been
going to this camp
for 200 years ”



Manitoba Impacts

Increased risk of more frequent
and large magnitude severe storms
and related damage



The international response

- In 1992, Canada and 154 others signed the UN Framework Convention on Climate Change
- Canada one of 160 signatories of 1997 Kyoto Protocol to UNFCCC
- Target: reduce GHG emissions to 6% below 1990 levels during 2008-2012 (240 MT reduction target annually)
 - Manitoba target: 23% below 1990 levels

How does Canada compare?

- Canada is responsible for 2.5% of international GHGs.
- 3rd-largest emitters per capita, after U.S. & Australia



What Manitoba is doing...



Ethanol and
biofuels



Low-impact hydroelectric
generation (Wuskwatim, Gull, Conawapa)

- Clean power exports to Ontario

Hydrogen Fuel



Wind Power



Power for generations to come

Personal GHG Emissions



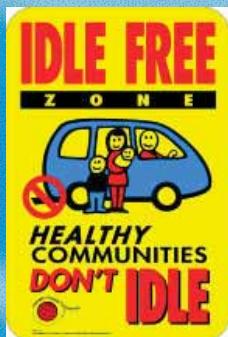
- appliances and lighting
- water heating
- waste
- home heating
- vehicle
- other

Actions by individuals
account for 28% of GHG
emissions each year
(6 tonnes)

What can I do?

- Taking action to reduce emissions will slow the rate of climate change, save money and produce other environmental and health benefits.

Do not idle
your vehicle



Recycle or
compost

Turn off lights
and electrical
appliances



Make your
home more
energy-
efficient

Plant trees



The background of the slide features a vibrant blue sky filled with wispy white clouds. In the lower-left foreground, a large, luminous, pale yellow/orange orb, resembling a rising sun or a planet, casts a warm glow and creates a lens flare effect. The overall atmosphere is serene and hopeful.

Thank you

Questions?

Current NH temperatures are very unusual within at least the past 1000 years *optional slide*

